

# Influence of Artificial Intelligence on Problem-Solving Ability and Confidence of Beginner Programmers

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**Abstract** — Artificial Intelligence (AI), particularly Generative AI (GenAI) tools such as ChatGPT, has significantly influenced programming education by providing instant code generation, debugging support, and conceptual explanations. These tools are increasingly used by beginner programmers to assist in learning and problem-solving tasks. While AI has the potential to enhance learning efficiency and boost learner confidence through immediate feedback, concerns remain regarding its impact on independent thinking and long-term skill development. This study investigates the influence of AI tools on the problem-solving ability and confidence of beginner programmers. The research examines how learners interact with AI-assisted systems, how frequently they rely on generated solutions, and how such usage affects their understanding of programming concepts. Data was collected through a survey-based analysis of beginner programmers using AI-assisted tools. The findings indicate that AI tools can improve problem-solving efficiency and significantly enhance learner confidence by reducing frustration and providing instant support. However, excessive reliance on AI-generated solutions may limit the development of critical thinking and independent problem-solving skills. The study highlights the importance of balanced AI integration in programming education. This research contributes to the growing field of computing education by providing insights into both the benefits and limitations of AI-assisted learning. It also offers recommendations for educators to design effective learning strategies that leverage AI tools while preserving core problem-solving abilities.

**Keywords**— Artificial Intelligence, Generative AI, ChatGPT, problem-solving, confidence, programming education

## I. INTRODUCTION

Artificial Intelligence (AI) has significantly transformed the process of software development and programming education in recent years. The emergence of AI-powered coding assistants such as ChatGPT by OpenAI and GitHub Copilot by GitHub has provided beginner programmers with instant access to code generation, debugging support, and conceptual explanations [1], [2]. These tools are very helpful in the learning process, making programming education more accessible and efficient for beginner programmers. The problem-solving ability is a fundamental skill in programming and it is considered as integral part of programming education [5]. Problem solving skill is a process of proposing a solution for a given programming problem [6]. Programming is considered as one of the most demanding and challenging field of study in computer science and related area [7]. At the same time, confidence plays a crucial role in maintaining motivation and engagement during the learning process. Studies have shown that immediate feedback and assistance can enhance learner confidence and reduce frustration [3]. AI tools provide real-time solutions to programming problems and have potential to positively impact both problem-solving efficiency and confidence levels.

However, the growing reliance on AI tools has raised concerns regarding their long-term impact on learning. Some researchers argue that excessive dependence on AI-generated solutions may limit the development of critical thinking and independent problem-solving skills [4]. Beginners may rely on AI without fully understanding the logic behind the solutions, which can strongly affect the deep learning and skill development.

Despite the widespread adoption of AI in programming education, there remains a research gap in understanding its combined effect on both problem-solving ability and confidence among beginner programmers. Most existing studies focus either on learning efficiency or tool effectiveness, without addressing the cognitive and behavioral aspects of AI usage.

This research aims to analyze the influence of AI on beginner programmers by examining how it affects their problem-solving approaches and confidence levels. The study evaluates both the benefits and potential drawbacks of AI usage and provides insights into how these tools can be effectively integrated into the learning process without compromising long-term skill development.

## II. RELATED WORK

Recent studies have showed the impact of Artificial Intelligence (AI) tools, particularly generative AI models such as ChatGPT and GitHub Copilot, on programming education. These tools significantly influence how beginner programmers learn, solve problems, and build confidence.

Several studies highlight the positive impact of AI on learning outcomes. Research indicates that students using AI tools demonstrate improved problem-solving skills and increased motivation to explore programming concepts [5]. AI systems provide instant feedback, automate repetitive tasks, and assist in understanding complex programming logic, making them effective learning aids for beginners [6]. Additionally, studies have shown that AI tools can enhance code comprehension and even perform at a level comparable to novice programmers in explaining programming concepts [7].

Empirical research also suggests that AI tools improve performance and productivity among students. A study conducted on undergraduate students found that AI-assisted learning can enhance creativity, efficiency, and confidence during programming tasks [8]. Comparative studies between tools like ChatGPT and GitHub Copilot indicate that these technologies contribute positively to students' learning and problem-solving abilities [9].

However, several researchers have raised concerns about the potential negative effects of AI usage. One major issue is over-reliance on AI-generated solutions, which may reduce critical thinking and independent problem-solving ability [10]. Studies show that beginners often depend heavily on AI tools without fully understanding the underlying logic, leading to weaker knowledge retention.

Furthermore, research highlights that while AI improves short-term performance, it does not always lead to long-term knowledge gains. Experimental studies reveal that although beginners complete tasks faster using AI, their conceptual understanding does not significantly improve unless AI is used as a supportive learning tool.

Despite these findings, there is still limited research focusing specifically on the combined impact of AI on both problem-solving ability and confidence among beginner programmers. Therefore, further research is required to understand how AI simultaneously influences cognitive skills and psychological factors such as confidence in programming.

## III. METHODOLOGY

This study is based on a quantitative research approach to examine the impact of Artificial Intelligence (AI) tools on the problem-solving ability and confidence of beginner programmers. A survey-based method was employed to collect data from participants who actively engage in programming and utilize AI tools such as ChatGPT and GitHub Copilot.

### 1. Data Collection

The primary data for this study was collected through a structured questionnaire designed to evaluate the behavior, learning patterns, and confidence levels of beginner programmers. The survey consisted of multiple-choice questions and Likert scale-based items to capture both quantitative and perceptual responses.

The questionnaire focused on the following aspects:

- Frequency of AI tool usage
- Types of programming tasks performed using AI
- Problem-solving approaches (independent vs. AI-assisted)
- Confidence levels after using AI tools
- Degree of dependency on AI-generated solutions

The survey was distributed among undergraduate and postgraduate students with basic programming knowledge. A total of 22 valid responses were collected and analyzed for this study.

### 2. Data Analysis

The collected data was analyzed using percentage-based statistical methods to identify patterns and relationships between AI usage and learning outcomes. The responses were categorized and visualized through tables and graphical representations.

A comparative analysis was also performed between participants who frequently use AI tools and those who use them occasionally.

### 3. Research Design

The research follows a descriptive and analytical design. It aims to describe current trends in AI tool usage among beginner programmers and analyze their influence on learning behavior and confidence. The study does not involve experimental manipulation but is based on observed responses collected through the survey.

This approach enables a structured understanding of how AI tools affect beginner programmers while maintaining a balance between practical observation and analytical interpretation.

## IV. RESULTS

The survey data collected from 22 participants was analyzed to understand the influence of Artificial Intelligence (AI) tools on beginner programmers.

### 1. Usage of AI Tools

The analysis shows that AI tools are widely used among beginner programmers.

- Around 68% of participants reported using AI tools frequently.
- Approximately 32% reported occasional usage.
- ChatGPT was identified as the most commonly used AI tool. This indicates that AI-assisted programming has become highly popular among beginner learners.

### 2. Purpose of Using AI Tools

Most participants reported using AI tools for:

- Writing code
- Debugging
- Understanding programming concepts
- Multiple programming-related tasks

A majority selected “All of the above,” showing that AI tools are used as multi-purpose learning assistants.

### 3. Impact on Problem Solving Ability

The findings indicate that AI tools positively affect programming efficiency.

- Most participants stated that AI tools help them solve programming problems faster.
- Many participants preferred a combination of independent problem-solving and AI assistance.
- A smaller number relied immediately on AI tools.

These findings suggest that AI improves accessibility and reduces the difficulty faced by beginner programmers.

### 4. Confidence Improvement

A significant number of participants reported improved confidence after using AI tools.

- More than half of the respondents experienced significant improvement in confidence.
- Several participants reported slight improvement.
- Only a few participants reported no change.

This demonstrates that AI tools help reduce hesitation and encourage learners to attempt complex programming problems.

### 5. Dependency on AI Tools

The results also reveal some dependency on AI-generated solutions.

- Many participants admitted feeling dependent on AI tools while coding.
- Some respondents reported only occasional dependency.
- A smaller group reported no dependency.
- This suggests that although AI tools improve productivity, excessive reliance may negatively affect independent thinking and long-term problem-solving skills.

Overall, the findings show that AI tools provide major benefits in learning programming, especially in improving confidence and efficiency. However, balanced usage is necessary to maintain independent problem-solving ability.

## V. DISCUSSION

The findings of this study indicate that Artificial Intelligence (AI) tools play a dual role in programming education. On one hand, these tools significantly enhance learning efficiency by providing instant feedback, reducing frustration, and improving confidence levels among beginner programmers. The availability of real-time assistance encourages learners to attempt complex problems and engage more actively in the learning process.

On the other hand, the results also highlight potential drawbacks associated with excessive reliance on AI tools. A considerable number of participants reported dependency on AI-generated solutions, often bypassing the critical thinking process required for independent problem-solving. This behavior may negatively impact long-term skill development, as learners may not fully understand the underlying logic behind the solutions.

These findings are consistent with previous research, which emphasizes both the benefits and limitations of AI in educational contexts. While AI can act as a powerful learning aid, its overuse may reduce cognitive engagement and hinder the development of analytical skills.

Therefore, it is essential to adopt a balanced approach to AI integration in programming education. AI tools should be used as supportive learning assistants rather than replacements for active problem-solving. Educators can play a key role by designing structured learning strategies, encouraging

independent thinking, and guiding students on the effective and responsible use of AI tools.

Overall, the study highlights the need for controlled and mindful use of AI to maximize its benefits while minimizing its potential negative impact on learning outcomes.

### Limitations

Despite providing useful insights, this study has several limitations.

- The sample size was relatively small, with only 22 responses collected.
- The participants mainly belonged to undergraduate and postgraduate backgrounds, which may limit the generalizability of the findings.
- The research relied on self-reported survey responses, which may contain personal bias.
- Only selected AI tools such as ChatGPT and GitHub Copilot were considered.
- The study focused on short-term observations rather than long-term learning outcomes.

Future studies should involve larger datasets and more diverse participant groups.

## VII. CONCLUSION AND FUTURE SCOPE

### 1. Conclusion

This study examined the influence of Artificial Intelligence (AI) tools on the problem-solving ability and confidence of beginner programmers. The findings indicate that AI tools such as ChatGPT and GitHub Copilot play a significant role in enhancing the learning experience by providing instant feedback, code suggestions, and conceptual clarity.

The results demonstrate that AI tools improve efficiency and enable beginners to solve programming problems more quickly. A noticeable increase in confidence levels was also observed, as AI assistance reduces uncertainty and frustration during coding tasks. These advantages highlight the potential of AI as a powerful support system for novice programmers.

However, the study also identifies important concerns. Excessive reliance on AI tools can hinder the development of independent thinking and limit the growth of strong problem-solving skills. Many beginners tend to depend on AI-generated solutions without fully understanding the underlying logic, which may negatively affect long-term learning outcomes.

Therefore, it can be concluded that while AI has a positive impact on programming education, it should be used as a supportive tool rather than a substitute for active learning. A balanced approach—combining AI assistance with independent practice—is essential for developing strong programming skills and sustaining learner confidence.

AI tools should complement programming education rather than replace independent learning practices.

### Future Scope

This research highlights several directions for future work in the field of AI-assisted programming education.

Future studies can adopt experimental research designs to establish a clear cause-and-effect relationship between AI usage and problem-solving ability. Expanding the sample size and including participants from diverse educational and cultural backgrounds can improve the generalizability of the findings.

Additionally, future research can explore the long-term impact of AI tools on critical thinking, skill retention, and independent learning. Comparative studies between different AI tools and traditional learning methods may provide deeper insights into their effectiveness.

Another important direction is the development of structured guidelines or frameworks for the effective use of AI in programming education. Such frameworks can help learners utilize AI tools to enhance understanding while avoiding over-dependence.

Finally, integrating AI tools into formal educational systems and evaluating their role in structured learning environments can provide valuable insights into how these technologies can be effectively leveraged to improve learning outcomes.

## REFERENCES

1. OpenAI, "ChatGPT: Optimizing Language Models for Dialogue," 2023.
2. GitHub, "GitHub Copilot Documentation," 2023.
3. Shute, V. J., "Focus on Formative Feedback," *Review of Educational Research*, vol. 78, no. 1, pp. 153–189, 2008.
4. Kasneci, E., et al., "ChatGPT for Good? On Opportunities and Challenges of Large Language Models for Education," *Learning and Individual Differences*, 2023.
5. S. I. Malik et al., "Enhancing problem solving skills of novice programmers in an introductory programming

- course," *Computer Applications in Engineering Education*, vol. 30, no. 1, 2021.
6. M. De Raadt, "Teaching programming strategies explicitly to novice programmers," Ph.D. dissertation, University of Southern Queensland, Australia, 2008. [Online]. Available: <https://eprints.usq.edu.au/4827/>
  7. S. Iqbal and O. K. Harsh, "A self-review and external review model for teaching and assessing novice programmers," *Int. J. Inf. Educ. Technol.*, vol. 3, no. 2, pp. 120–123, 2013.
  8. A. M. Sallam, "ChatGPT Utility in Healthcare Education, Research, and Practice: Systematic Review on the Promising Perspectives and Valid Concerns," *Healthcare*, vol. 11, no. 6, Art. no. 887, 2023. DOI: 10.3390/healthcare11060887.
  9. M. Kazemitabaar, A. J. Yeung, X. Guo, et al., "How Novices Use and Benefit from Code-Generating AI Tools in Programming Education," *Proceedings of the 2024 ACM Conference on International Computing Education Research (ICER)*, 2024.
  10. N. Tankelevitch, J. Drozdal, S. Strohmam, et al., "The Impact of AI on Computer Science Education: A Review of Opportunities and Challenges," *ACM Conference Proceedings*, 2024.